

First of a Series on
ADVENTURES OF A PEBBLE

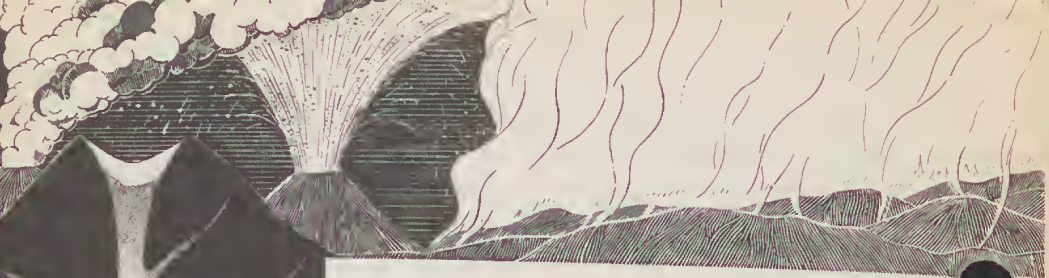
IN THE BEGINNING

by

ANNE STROMQUIST
Raymond Foundation



Museum Stories, Number 202
October 7, 1950



In the Beginning

Most people as they walk along this Chicago beach never notice me lying here with the other pebbles, although I'm certain you'll agree that I am more attractive than most of my pebble relatives. This is really quite amazing, considering some of the terrible experiences I have had. I don't look my age at all. In fact, my friends tell me I look younger every day. Perhaps that is because I am constantly growing smaller and smaller instead of just plain growing.

You certainly could never tell by looking at me that I am very old, and yet I have been wearing away since the day, almost two billion years ago, when I was formed. The earth itself was very young at that time and looked quite different from the world of today. This was the somber, strange, lifeless world of the Archeozoic era.

My career didn't start here in Chicago but up north quite a way, in what is now the south of Canada. At that time I was not a pebble because, you see, pebbles are pieces of larger rocks that have been broken into bits. The breaking-up

process is called erosion. It is accomplished by forces of nature like the wind and the water. You could never have a pebble without first having a larger rock, just as you could never have a cake crumb if you had not had a cake from which that crumb had broken.

The very first things that I can remember happened long before I was a pebble. I was still part of a huge mass of rock underneath the surface of the earth. Men have been able to dig quite deep into the earth's crust, but even the deepest mine or hole made by man goes down only about three miles. I was more than thirty miles down, where the temperature is so high that the rocks may be melted. This liquid rock, or magma, is hotter than the red-hot lava coming from a volcano. I was a tiny part of a magma that was pushing its way up to the surface of the earth along the weak places in the rock layers above. Should a magma reach the earth's surface it may cause a volcanic eruption, but most magmas harden underground.

Gradually I felt the magma stop moving and, after what seemed to me like ages, it appeared to be getting slightly cooler. Though I thought at first that this might be my imagination, I soon realized that I could not move around as I had been doing because I was truly cooling and becoming harder. The rock, with me as a part of it, had become solid. I was caught in a dark prison in which there was no space to move and from which there seemed to be no way to escape.

It was very uncomfortable at first, but one can get used to almost anything in time, and in a few hundred million years I felt quite at home in my cozy little place in the dark. Everything there was quiet and still. I was surrounded by the familiar rock I had known since the time, ages ago, when it had hardened from liquid magma. I did not know then of the surface of the earth somewhere up above me. As I lay deep in the earth's crust I never imagined the strange but wonderful adventures I would have in ages to come.

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Second of a Series on
ADVENTURES OF A PEBBLE

RIVER JOURNEY

by

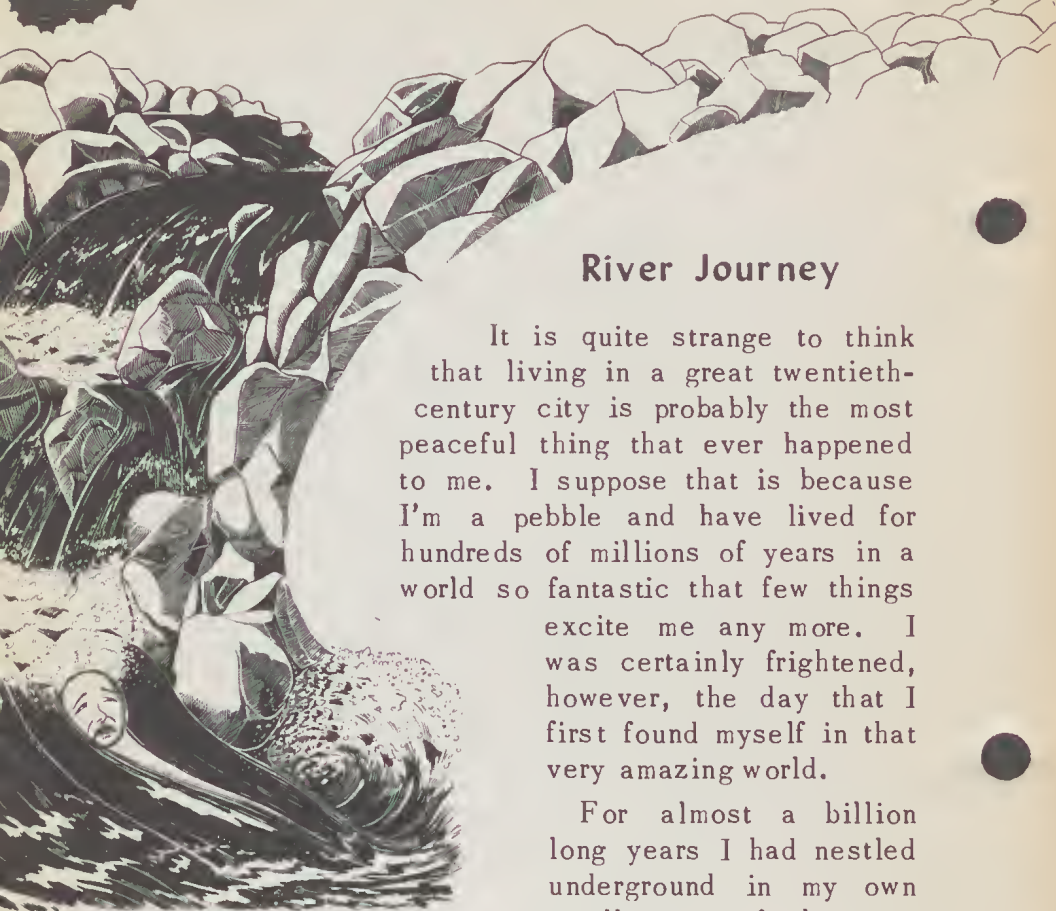
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October 14, 1950



River Journey

It is quite strange to think that living in a great twentieth-century city is probably the most peaceful thing that ever happened to me. I suppose that is because I'm a pebble and have lived for hundreds of millions of years in a world so fantastic that few things excite me any more. I was certainly frightened, however, the day that I first found myself in that very amazing world.

For almost a billion long years I had nestled underground in my own small part of the vast mass of rock that was my

home. I felt safe after all this time and had no worries at all until I became aware of a distant and strange noise that grew louder and louder till it seemed to be roaring from just above me. I had never heard anything like it, and I was terrified at what it might mean.

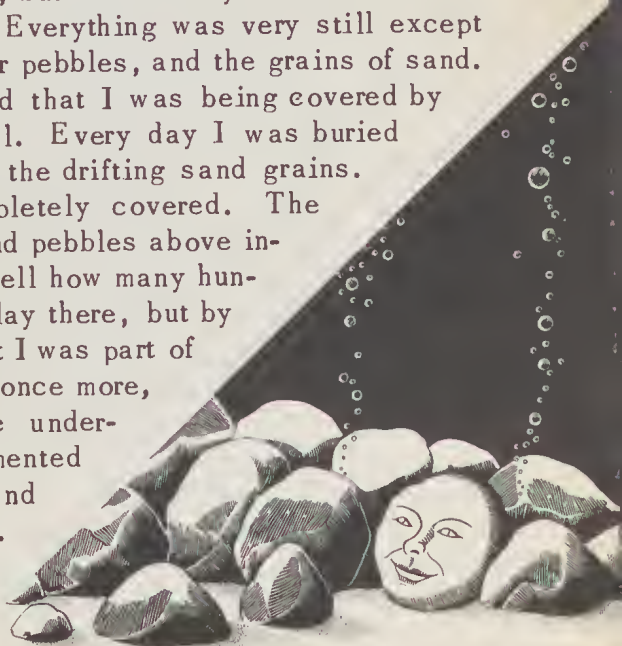
Suddenly I felt something flowing over part of me. I thought at first that it was a liquid rock such as I had been in my youth, but I realized that this liquid was cool. In time I came to understand that this was one of the most important substances on earth—just plain water. Soon what had at first been a friendly stream became a raging river. The rock around me was worn away and before long I was completely uncovered

on all but one side. In the course of time even that rock was worn down and I found to my horror that I was slipping away. Then I was roughly pushed, dragged, and bounced along in the water, but I had no time to think of comfort now. I was scared!

After a while I overcame my fears long enough to realize that I wasn't the only pebble being carried along by the swollen stream. We ranged in size from grains of sand to great boulders. Most of us were very young and therefore sharp and jagged. The river bottom along which we were moving was rough, and often we were thrown over cliffs and landed at the bottom bruised and shaken. In this way our sharp edges were worn down and we grew smoother and smaller as we got older.

Gradually our underwater path became less steep and bumpy. The water was calmer and we moved more slowly. By this time the river had widened so that I couldn't see its banks, and many of my companions were dropping behind. Finally I, too, came to a stop.

The light here was very dim and the colors were dull and drab. Since there was nothing of interest around, I decided to move on, but much to my horror there was nothing I could do. Everything was very still except the water, the smaller pebbles, and the grains of sand. After a time I noticed that I was being covered by some of this material. Every day I was buried deeper and deeper by the drifting sand grains. At last I was completely covered. The weight of the sand and pebbles above increased. I couldn't tell how many hundreds of centuries I lay there, but by and by I realized that I was part of a hard mass of rock once more, for materials in the underground water had cemented all of us pebbles and sand grains together. I was a prisoner.



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Third of a Series on
ADVENTURES OF A PEBBLE

MY FIRST LIVING FRIEND

by

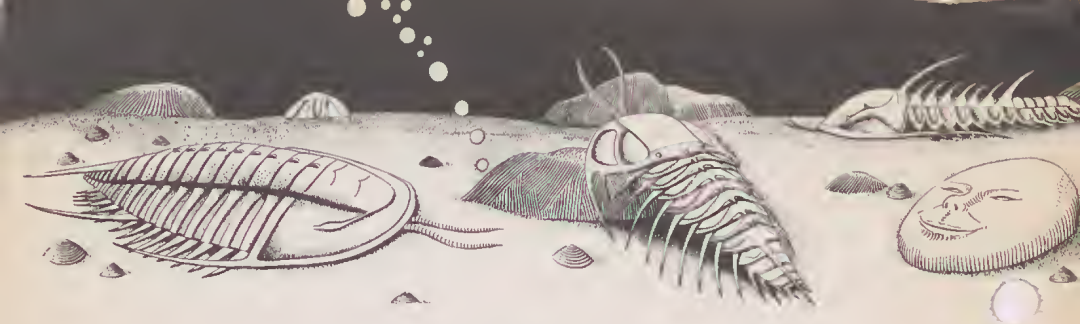
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Museum Stories, Number 204

October 21, 1950



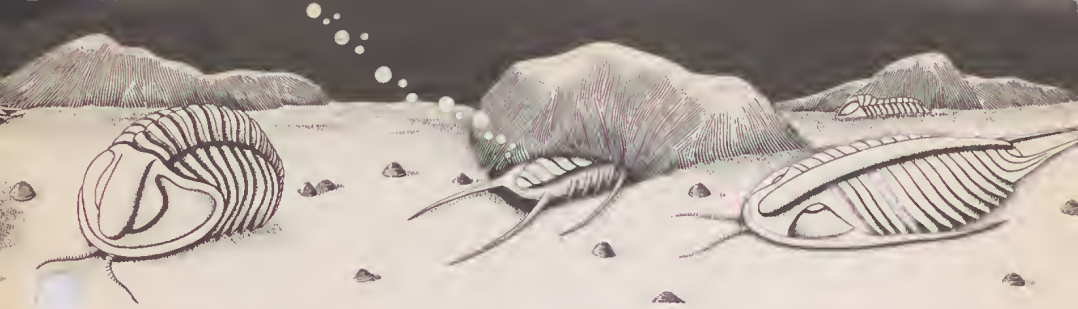
My First Living Friend

Perhaps you think that a pebble like me doesn't get around very much, but you would be amazed to hear of the things that happened to me more than a half billion years ago. At that time I was trapped in a great mass of rock and could not get free.

As long ages passed I gave up hope of ever getting out again. One day, however, my hope was restored because familiar things began to happen. I could hear again the beautiful and welcome sound of running water getting closer to me. Sure enough, in time I was bathed and tickled by the cool water. I longed for the moment when the rock in which I was caught would break into bits, and indeed it did. Once more I was carried along a familiar river-path down to the sea.

However, when I reached this shallow ocean I was astounded at the strangeness of the place. Soon I settled down to observing the scene about me. There were many strange things in the water. All sorts of animals without backbones swam and drifted to and fro among the seaweeds. Some of these creatures crawled along the sea bottom and others burrowed in the mud.

The creatures that were more numerous than all the other forms were the trilobites. The trilobites were the biggest and probably the smartest of the strange sea animals. Their name describes them quite well because it means three-lobed, and that is exactly what these creatures were. Instead of having a skeleton inside they had one on the outside of their body, and it was divided into three lobes: left, middle, and right. Their muscles were attached to the inside of this skel-



eton, and this hard shell was made of chitin, a horn-like substance secreted by their skin. The trilobites were of many kinds. They averaged from about one to four inches in length, but some were so tiny that you could scarcely see them and others were almost two feet long and probably weighed about ten pounds.

As they grew, the trilobites molted their shells like modern crabs. As a matter of fact, these creatures were members of the same family as today's crabs and lobsters. Many of the trilobites had compound eyes made up of thousands of little eyelets. They also had antennae, which served as organs of touch as they crawled along the sea bottom. Yes, though they lived in the water, the trilobites would usually crawl and only sometimes took off for a swim. It was quite amusing to watch them and their antics and surprising to see how they could curl right up.

The trilobites lived on this earth for millions of years and then about two hundred million years ago they completely died out. You'd think, then, that men would never even have heard of these animals, wouldn't you, except for the story that I have just told you. Yet, amazing as it may seem, men knew about trilobites before I ever said a word.

You can discover why and how if you search around the rocks of the Chicago region. You might have to go to a stone quarry to be successful. But if you really try hard enough you surely will find a trilobite fossil because many of the shells that the trilobites conveniently kept dropping here and there left impressions in the stone. In this way the trilobites made a permanent record of their prehistoric existence.

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Fourth of a Series on
ADVENTURES OF A PEBBLE

JET-PROPELLED SHELLFISH

by

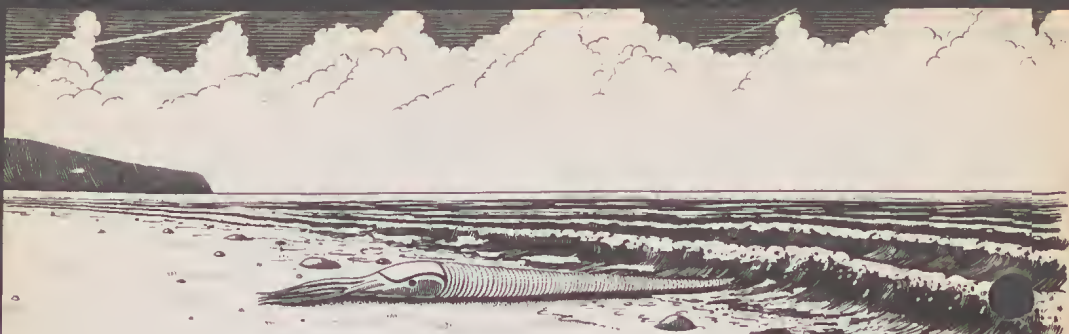
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October 28, 1950



Jet-Propelled Shellfish

Now that you are listening to my story, I know that you will realize how important I am. But many people have ignored me as I lie here because they don't realize what wonderful adventures a pebble can have. Once, I did almost get picked up by a lively little boy; but just as he reached down to get me, his attention was drawn to something else. Before I could make him hear me, he had snatched the object up and was running quickly off, calling to his friends to come and see what he had found. Oh, I suppose he had reason to be excited, for I had caught a glimpse of his prize. It was part of a cephalopod shell.

I can remember when the straight-shelled cephalopods were quite important in the prehistoric seas. Now they are nothing but fossils while I am still my same old self, except that I am a little smaller now because of the trying ordeals of my long career.

The cephalopods were members of the same family as the modern squid and the octopus. Cephalopods, however, had shells that were coiled, partly coiled, or straight. They were the biggest shellfish that ever lived on the earth. The shells of some cephalopods stuck straight out behind them like long narrow ice-cream cones, and others were only as big as pipe-stems. But many cephalopods had shells almost twenty feet long and a foot wide. They were the masters of the sea, and they were flesh eaters.

The word "cephalopod" comes from the two Greek words "head" and "foot." The "foot," which was divided into a number of arms, was wrapped around the "head." The foot was used by the cephalopod in moving about, but it was not used in the same way that a foot is usually used. By taking in water and then squirting a jet of it out of a funnel under his head, the cephalopod was able to shoot through the water like a torpedo. This method of moving was similar to the way in which the fastest planes move today, for the cephalopod was traveling by means of jet propulsion. The only thing wrong with his method of traveling was that he went through the water backwards.

Just imagine the silly cephalopod not only traveling through the water in reverse but also carrying with him that long straight shell. Later, the shells of these creatures were curved. First they were only loosely coiled, but in time they coiled very tightly. Then the cephalopod was much better off because the coiled shell was not so cumbersome as the long straight one. Then, too, the air-filled compartments of the big shell were right over his body. This made him better balanced and he could float more easily. Some of these curved shellfish by Cretaceous time (only 100 million years ago) had shells almost seven feet across. They hold a record for size that has not been equalled since.

Eventually all the cephalopods with straight shells died out. Perhaps competition with animals that had backbones proved too much for them. Their long shells, however, were fossilized and left a record in stone of their existence. The modern squid—the descendant of the cephalopod—depends for protection not on a heavy shell but on his ability to move quickly through the water when there is danger. A small, useless, horny plate, shaped like a feather and buried in the flesh of the squid, is all that is left of the great big shell of his ancestors. Just think how much luckier he is than his extinct cephalopod relatives.

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Fifth of a Series on
ADVENTURES OF A PEBBLE

CHICAGO'S CORAL CITIES

by

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Museum Stories, Number 206

November 4, 1950

Chicago's Coral Cities

Because I am a pebble with a view of Chicago's skyline, I have seen the city grow and, as I watched, I thought of a city that I saw built in this very spot by creatures quite unlike the inhabitants of Chicago. Luckily, undersea currents had rolled me about and animals had scuffed me out of the mud so that I was not buried at that time. This was almost four hundred million years ago, and the scene in Chicagoland was quite different, indeed. The land was again covered by a great warm sea; but in spite of this fact there were countless creatures living together here in huge clusters of "buildings"—cities that they themselves had built. These were the corals.

You have surely heard about corals that build reefs today, and you probably know also that coral reefs are found in the warm tropical regions of the world. This kind of coral is an animal that can't survive in a region unless the climate is tropical. The reef-building corals of today are very much like those that lived in ancient times. And so, because we know the habits of corals that are living now, we know that Chicago about 360 million years ago was a shallow sea and that its climate was warm all the year around.

Actually, the name of the coral animal isn't coral at all, but polyp. This polyp is able to take out of the water a substance called lime, of which certain rocks are made. This would appear to be a task harder than it sounds because the lime is completely dissolved in the water and can't be seen at all. After the polyp removes the lime from the sea, he uses it to build his little house. The house is a kind of tiny cup in which the polyp sits. It is this house, built by the polyp, that is known as the coral.

The little polyp is just a hollow blob of soft fleshy tissue with an opening on top. This opening, the mouth of the polyp, is surrounded by tiny waving arms. The

polyp builds his house not only for comfort but also for protection because he is so soft and almost too small to be seen. The limy coral serves as an outside skeleton or protective armor for the polyp. Most corals live together in groups or colonies, although each polyp stays by itself. It is the colonial corals that build the great coral reefs or "cities." The coral cities of Chicagoland were much more beautiful than the cities built by men, and their inhabitants did not have a housing shortage. As



Present-day coral

a matter of fact, though the polyps built their houses skyscraper-high in proportion to their tiny bodies, they only lived in the penthouse apartments. The polyp just didn't know when to stop building.

In order to eat, the little polyp sticks his tiny arms above the wall of his room. He waves them back and forth to sweep all sorts of microscopic plants and animals toward him. He sweeps these into the opening on his top side. In the meantime, however, he is still building the walls of his room higher and higher.

After a while, the wall is so high that the polyp can't reach over the top for food. Then he pulls himself up and builds a floor underneath himself so that he can again reach over the side. The polyp does not learn from this experience; and so the great reef is built higher and higher, up to the ocean surface.

Although the polyp himself does not become fossilized, the great reefs that he builds do. In many places around Chicago you can see the fossilized ancient reefs right in the rock that formed above them.

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Sixth of a Series on
ADVENTURES OF A PEBBLE

UNDERSEA ANIMAL GARDENS

by

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Museum Stories, Number 207

November 11, 1950



Undersea Animal Gardens

Most people who walk along here go past without even noticing me, but you heard me because you were bending over. You looked so interested in what you were doing that I wanted to help you, and so I asked you what you had picked up. You showed me the little object that you held in your hand.

Perhaps you have seen such objects quite often along the beaches of Lake Michigan—small, round, flat little stones with a hole in the middle. Sometimes the children put them on strings and call them Indian beads. To look at these little stones you probably would never guess that they are parts of animals that lived here in Chicago millions of years ago. Of course there was no Chicago then. There weren't even any people, as a matter of fact, or any animals like the ones you know about today. The animals that lived then were very strange.

The little round stones are parts of one of these strange animals. The name of the animal is crinoid, and perhaps it will be a surprise when I tell you that its nickname is sea-lily. That certainly seems like a strange name to use for an animal, but you wouldn't think the name so very strange if you could see one of the sea-lilies alive and whole. The crinoid or sea-lily was an animal that might easily fool you because it looked very much like a beautiful underwater plant.

Crinoids lived together in groups, and a garden of these sea-lilies, although rather weird, was very beautiful, for crinoids were brilliantly colored. Some of them were patterned in many different ways.

Try to imagine the strange but beautiful undersea gardens of plants that were really animals. Now think how a starfish would look if it were on its back, mouth up, because the sea-lily belongs to the same family as the starfish. The top or flower-like part of the ancient crinoid had five movable arms surrounding its mouth. Each arm branched into many more arms, all of them covered with feathery whips that swept microscopic animals down into the mouth of the crinoid.

A stem was attached at one end to the middle of the crinoid's back or under side. The other end of the stem could fasten itself to the ocean bottom. Some of the prehistoric sea-lilies became anchored to one spot in this way. Some of them had almost no stems at all and others had extremely long stems. Most of the sea-lilies, however, had stems that were from one to three feet long. When the sea-lily was very young, it swam around in the shallow warm sea water; but when it grew older, it attached this long stem-like piece of itself to the ocean bottom. This stem was made of limy plates or segments, and each of them was like the one that you are holding in your hand.

Besides the stem segments the crinoids had many hard parts that became fossilized. Unfortunately, these fossil pieces easily fell apart, and for this reason very few complete fossil crinoids have ever been found. Sea-lilies, however, are still living in many parts of the world, and so we know exactly how the prehistoric ones looked. But today these attached plant-like animals are very seldom seen because they live only in the deep parts of the oceans. Most of the crinoids that live now do not have stems and can swim freely in shallow water. They move about by folding and unfolding their arms.

Of course, I haven't seen any of my ancient crinoid acquaintances around here for millions of years. But I am very often reminded of them when someone comes by and picks up part of their fossil remains.

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Seventh of a Series on
ADVENTURES OF A PEBBLE

VISITOR FROM THE SWAMP FOREST

by

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Raymond Foundation



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November 18, 1950

Visitor from the Swamp Forest

I am only a pebble, as you know, and so I am not able to move around whenever I get the notion. But as time passed, the waters in which I had lain for millions of years got lower and my home became a marshy swamp. Then insects brought news of other regions.

One day, a creature unlike any I'd ever seen came crawling clumsily along and not only stepped all over me but scuffed me out of the mud in which I was partly buried. Then, without a word of apology, he sat down right on top of me. That was about 250 million years ago and I still hadn't learned to control my temper.

"Say! What do you think you're doing!" I shouted at him. You should have seen the fellow jump.

"I'm very sorry, but I just didn't see you," he murmured shyly. "I'm so tired that I'm afraid I wasn't looking where I was going."

He certainly seemed like a nice fellow although he wasn't very attractive. He was a lizard-like creature, very much like a salamander but quite a bit bigger. I was sorry almost at once that I had been so short with him and apologized for my bad temper.

"You must have come a long way to be so tired!" I remarked in a friendly way.

"Yes, indeed, at least fifty miles," he said. "But I think I'll turn around and go back again. I'm lonesome already for my old home."

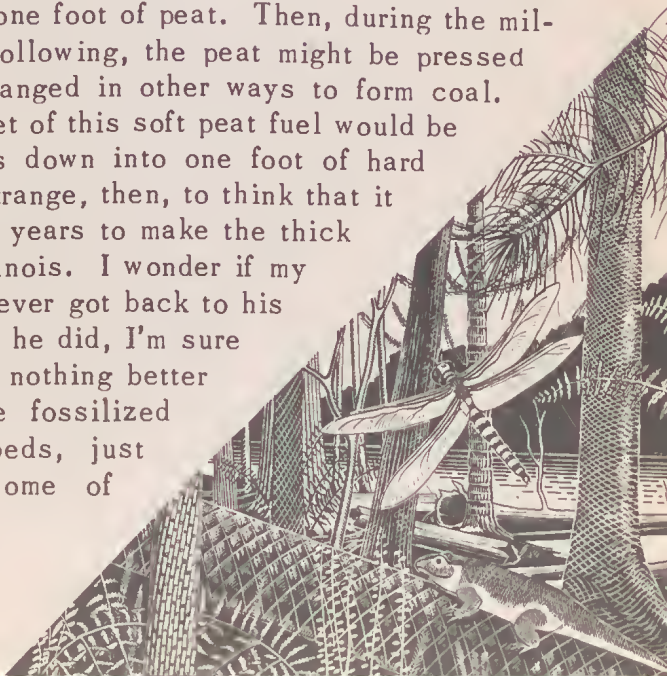
Then he began to tell me about the beautiful swamp where he lived. Just imagine a huge, steaming forest in a great bog. There were no colors except shades of brown and green, for there were no flowers then. Great insects buzzed and hummed among the trees and other fern-like plants, and lizard-like animals basked in the warm mud and slithered among the giant stems. Except for these, no sounds were heard but the swishing of the wind through the trees.

Some of the trees towered to heights of one hundred feet, and yet these giants of the past are ancestors of the club moss, a little plant that, today, is just a few inches high. These trees had leaves set closely together, covering their trunks. When the leaves fell off, the surface of the trunk was left covered with markings like the scales on a snakeskin.

The insects, too, were enormous. There were dragonflies over two feet long from wing-tip to wing-tip and cockroaches up to four inches long and in hundreds of different varieties. It's probably a lucky thing there weren't any people living at this time!

How big the forms of life grew in the tropical climate and how fast! They almost choked each other out of place. After the great trees died, they would fall beneath the swamp water and pile up on the muddy bottom. The water protected them from the bacteria in the air, which would have caused them to decay. Because of this, instead of rotting away, the trees were changed into a substance called peat. Peat is used in some parts of the world for fuel.

During a hundred years in such a swamp forest enough dead plants collected at the bottom of the swamp to make one foot of peat. Then, during the millions of years following, the peat might be pressed together and changed in other ways to form coal. About twenty feet of this soft peat fuel would be needed to press down into one foot of hard coal. It isn't strange, then, to think that it took millions of years to make the thick coal beds of Illinois. I wonder if my friendly visitor ever got back to his beloved bog. If he did, I'm sure he'd have liked nothing better than to become fossilized in the coal beds, just exactly like some of his relatives.



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Eighth of a Series on
ADVENTURES OF A PEBBLE

CHICAGO'S GREAT ICE SHEET

by

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Raymond Foundation



Museum Stories, Number 209

November 25, 1950

Chicago's Great Ice Sheet

So you think the winters in Chicago are cold! Well, you should have been here about a million years ago. Even an Eskimo would have complained of the Chicago climate then. But there were no Eskimos, and most of the animals had either gone south as the days and years became slowly colder or, like most of the plants, had died out because of the cold.

I wasn't at the surface of the earth at that particular time because I had again been trapped in the sea sediments and buried well over my head, as had often happened before. In the North a great quantity of ice and snow was being piled up till the heap was so big that it began to spread out and creep slowly southward at the edges. The great ice sheet finally reached as far as what is now southern Illinois, and the freezing winds blowing from its edges brought great blizzards. Soon the sun could hardly make itself felt at all, and the rock around me got colder and colder. I thought I would never be warm again.

I could hear sounds of grating and crushing above me as the great tongue of ice spread over the land and rock. The giant wall of ice at the front of the tremendous glacier advanced and scraped all the soil away from the rock underneath. It also scraped, gouged, and smoothed the rock. As time passed, the scraping sounds above me got louder and louder until one day the earth around me trembled and heaved, and almost before I realized it I was again moving along. The rock around me was broken up, and even if I did not go very far I was worn down again and scratched. I seemed to go only a short distance and then I bumped into an obstacle of some sort and stopped moving.

I stayed in this spot for a long time, piled up with many other pebbles and rocks until the ice above me melted away and I could see the rest of the icy wastes around me. Scores of thousands of years passed in this

way, and at last the sun's rays began to get warmer and warmer and the ice began to melt away. Great rivers of water flowed from the edge of the retreating glacier and, where the ground was hollowed out, the water collected in lakes and ponds.

One of the greatest of these ancient glacial lakes has been given the name of Lake Chicago. It existed on the land where Lake Michigan is today, but it was much bigger. It covered parts of what is now the city of Chicago, and I, too, was covered by its waters. At its highest, the water level of ancient Lake Chicago was about fifty-five feet above the level of Lake Michigan. Because the glacier would melt and flood the lowlands and then again regain its strength, the level of this ancient lake did not stay the same. At times it would grow bigger and the moving water at the bottom would carry me from one place to another, and at other times I was caught in the glacier's icy grip. Finally the lake dwindled to its present size and left me and many like me stranded on this beach.

In the meantime man had appeared on the scene. Coming from the north, bands of brave hunters followed herds of animals to the south. All the changes I have told you about took millions of years, but with the coming of man there were very rapid changes indeed. If this goes on, I'll have many more strange stories to tell before I am completely worn out.

Sometimes animals called mastodons passed over the ice sheet



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